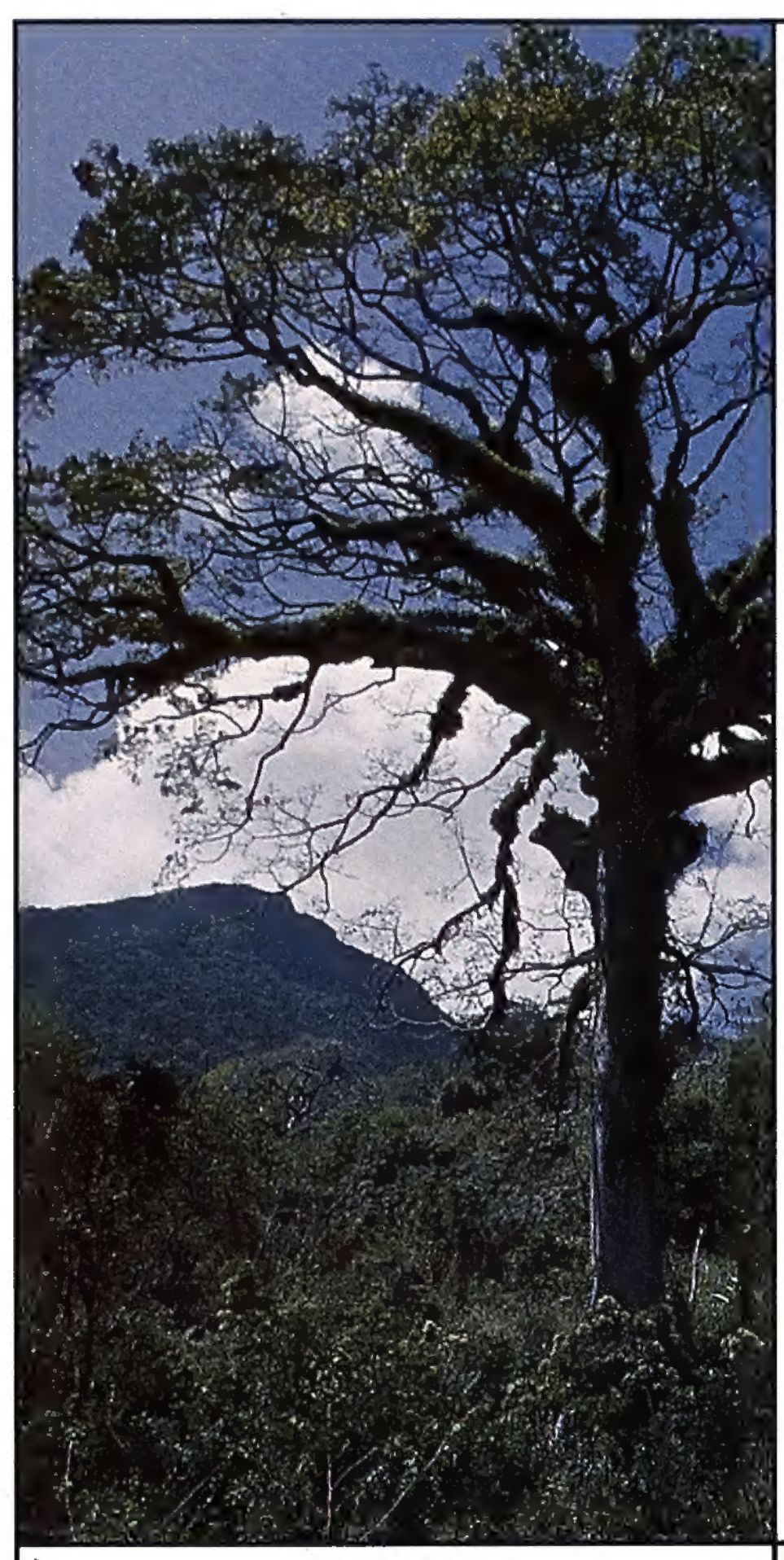
Flora Mesoamericana

Research at the Missouri Botanical Garden



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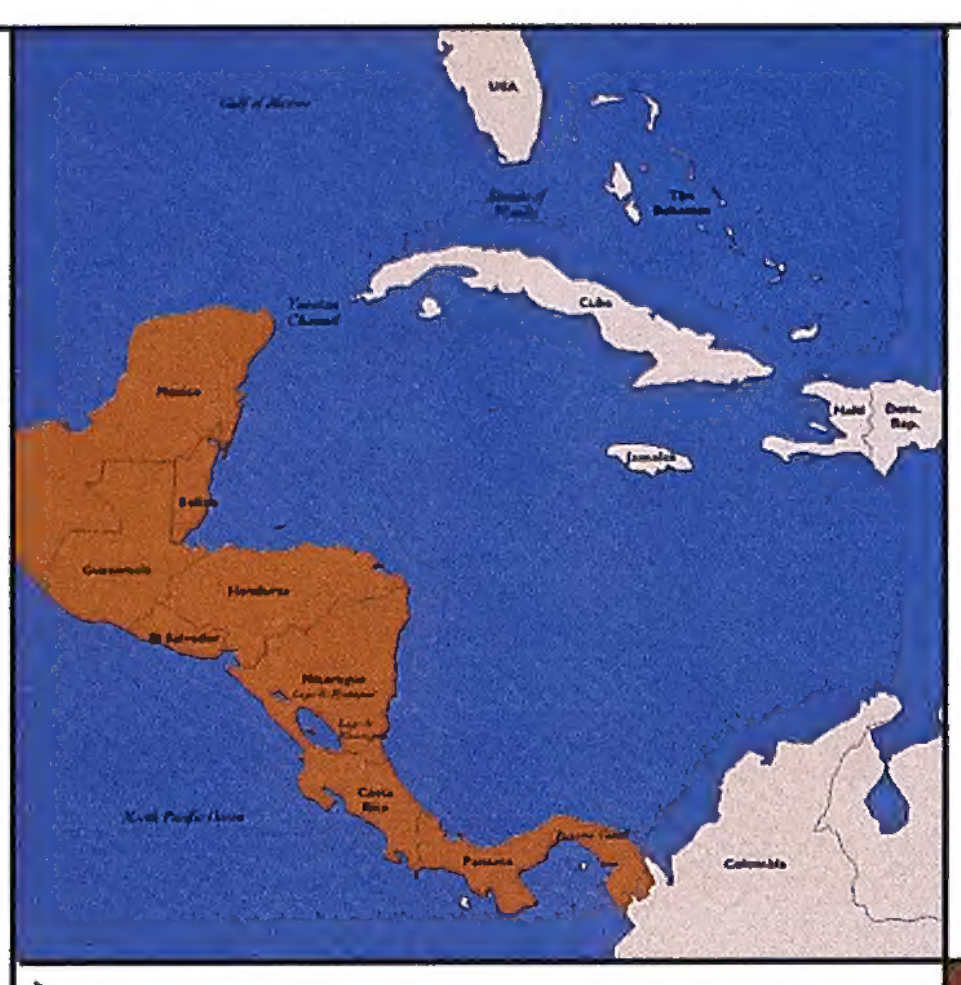
***Flora Mesoamericana* is an international collaborative project** to produce a definitive account of the native and cultivated plants in Middle America. The region includes the southern states of Mexico – Campeche, Chiapas, Quintana Roo, Tabasco, and Yucatán – plus Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, and Panama. **About 18,000 species, 7% of the world's estimated 250,000 species of vascular plants, occur in the 800,000 square-kilometer region**. The Flora involves hundreds of contributors and is directed jointly by MBG; Instituto de Biología, Universidad Nacional Autónoma de México (UNAM); and The Natural History Museum, London (BM). Volume 6, the first of seven, was published in March 1994 by UNAM in Mexico City. **This is one of the largest floras ever attempted and the first regional flora ever published in Spanish. Floras include plant names, descriptions, distributions, and identification keys.** In Nicaragua the kapok tree, *Ceiba pentandra*, left, is the source of a common stuffing fiber. [DN]



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Biogeography – Distribution: Mesoamerica is the northernmost fully tropical area in the Western Hemisphere. The region has special importance in the study of the movement of plants and animals because it **is the only extant land bridge between two large continents.** Dr. Gerrit Davidse, right, shown collecting in Belize, is the John S. Lehmann Curator of Grasses at MBG. He has been U.S. coordinator of *Flora Mesoamericana* since its inception in 1980. [AB]

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Biogeography – Diversity: In Mesoamerica, steep mountain ranges rise out of a relatively narrow land mass, creating a series of tightly packed life zones, each with its own microclimate. As a result, **destruction or alteration of even small areas can quickly eliminate many plants and associated animal species.** Active volcanoes help enrich biodiversity by creating new, open sites for speciation; *Senecio oerstedianus,* right, grows on the slopes of Volcán Irazú, Costa Rica. Below, Lago Atitlán, Guatemala. [WB],[WB]

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Computerization – Accessibility: In addition to the traditional series of published books, ***Flora Mesoamericana* is being computerized** utilizing TROPICOS, the botanical database developed at MBG. *Flora Mesoamericana* will also be available on-line through the Internet, further promoting rapid access to information which can be constantly updated. **Today all MBG floristic projects include production of a computerized database and all will be made available on the Internet.** [CW]

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Habitat – Forests form the dominant natural vegetation of Mesoamerica. Seasonal forests, where a pronounced dry season alternates with a rainy season, are best developed along the Pacific slope of the continental divide in southwest Mesoamerica. This type of forest also dominates the flat plain of the Yucatán Peninsula. Although some trees along water courses remain evergreen, away from rivers most trees are deciduous. Below, El Sumidero, Chiapas, Mexico. [GD]

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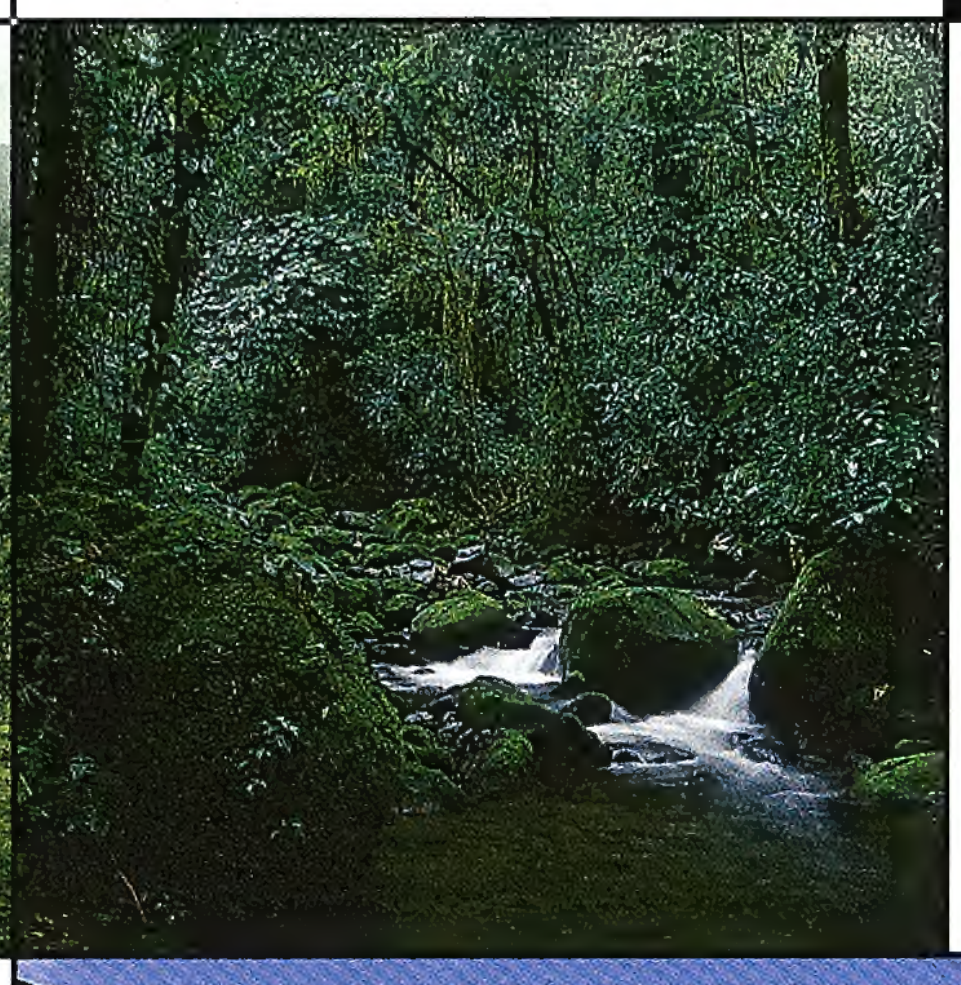
Habitat – Rain forests: Forests with very high precipitation usually every month of the year are best developed at lower elevations on the Caribbean side of the continental divide in northern and eastern Mesoamerica, and in the south on the Pacific side in the Darién of eastern Panama and the Osa Peninsula and Golfo Dulce region of Costa Rica. **Wet lowland rain forests are biologically the richest habitats on earth.** At right, lowland rain forest, Parque Nacional Braulio Carrillo, Costa Rica. [BEH]



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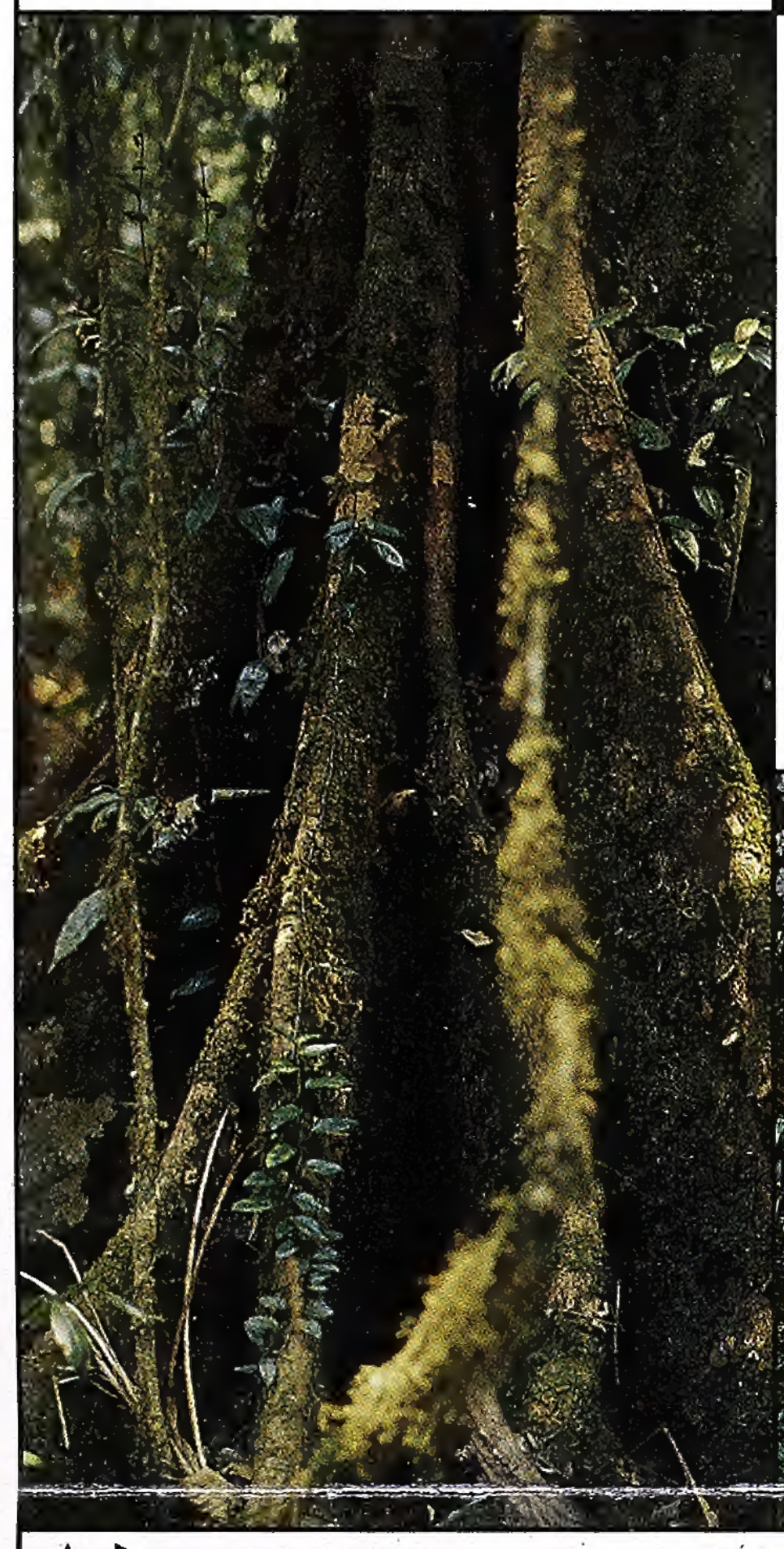
Habitat – Montane forests: Forests with evergreen, broad-leaved trees dominate mountain slopes from low to upper elevations throughout Mesoamerica, where they receive evenly distributed high rainfall. Epiphytic orchids, bromeliads, aroids, and ferns are common. **Tree ferns often are conspicuous elements in the lower story of these forests.** At left, Reserva Forestal de San Ramón, Costa Rica. [WB]

Biogeography – Migration: Closure of the land bridge in the region of present day Panama approximately 2.5 million years ago created the opportunity for direct migration of organisms between South America and North America. **The San Juan Depression** in Nicaragua is a lowland break in the mountainous backbone of Mesoamerica and forms a significant partial barrier for the north–south migration of species.

Habitat – Pine/Oak forests: From Chiapas to central Nicaragua, **forests dominated by pines, *Pinus*, and oaks, *Quercus*, are characteristic of middle elevations.** In such forests many species of oak combine with fewer species of pine to form distinctive associations based on differences in soil, moisture, slope, and altitude. Below, a pine forest in central Honduras. [GD] ▼



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Habitat – Páramos: The highest mountain regions in western Panama, Costa Rica, Guatemala, and Chiapas are **covered by treeless subalpine vegetation** dominated by bunch grasses, ericad and composite shrubs, and, in Panama and Costa Rica, by shrublike bamboos of the genus *Chusquea.* MBG is collaborating with the National Museum of Costa Rica and the National Institute of Biodiversity (INBio) to produce a field guide in Spanish, *Manual de las Plantas de Costa Rica*. Right, Cerro Chirripó, Costa Rica. [WB]

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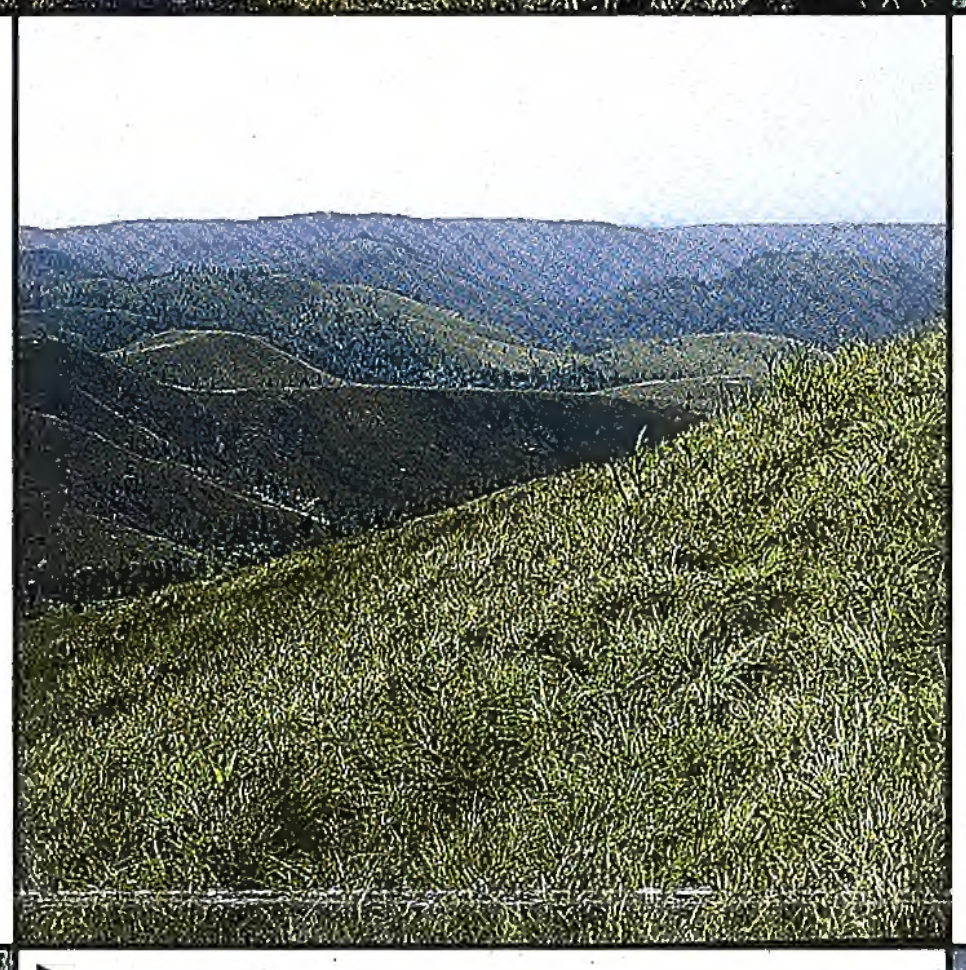
Habitat – Cloud Forests: Upper portions of mountain ranges are often covered by clouds and fog and are dominated by evergreen, broad-leaved vegetation. Such cloud forests occur nearly the entire length of Mesoamerica. Herbaceous vines are more common there than woody lianas; mosses, liverworts, and ferns are the dominant epiphytes, with proportionately fewer orchids and aroids. Left, Cordillera de Talamanca cloud forest in Limón, Costa Rica. [GD]



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Habitat – Wetlands: Specialized aquatic habitats range from stately flooded forests along the lagoons and natural canals of the Caribbean Mosquitia coast of Costa Rica, Nicaragua, and Honduras to the enormous marshes of Tabasco, Mexico. Characteristic and prominent along the sea coast are **mangrove forests** dominated by *Avicennia, Conocarpus, Laguncularia,* and *Rhizophora,* as on the Pacific coast of Honduras, above. [GD]

◀ **Habitat – Savannas:** Natural savannas are uncommon in Mesoamerica and occur primarily at low elevations in areas of seasonal rainfall. Typical savannas occur along the Pacific slope of the central cordillera from Panama to Chiapas, in parts of the coastal plain centered in Tabasco, Mexico, and in Belize (left). Special edaphic savannas also occur on volcanic slopes and on white-sand soils. **Typical savannas are desirable for agriculture, which alters the natural vegetation,** with introduced grasses and weedy shrubs often taking over from native bunch grasses. [GD], [GD]

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MBG and the Tropics – Buttressed trunks (above), providing strong structural support, are a common feature of many tropical trees. Trees are far more abundant and diverse in the tropics than in temperate regions. Although **tropical forests cover less than 7% of the Earth's surface, two-thirds of the world's 250,000 species of flowering plants occur only there.** Tropical forests maintain nutrients primarily in living tissues rather than in the soils; **when areas are cleared for settlement, agriculture, or lumber (right), the ecosystem cannot easily be reestablished, leading to permanent loss of plant species and the animals that depend on them. Scientists estimate that most tropical forests worldwide will be destroyed or permanently damaged in the next 20 years,** if no measures are taken to protect them. MBG has the world's most active research program in tropical botany, working to inventory species diversity and gather basic knowledge about tropical plants before they disappear forever. **Knowledge of plant biodiversity is basic to planning for sustainable development.** [GD],[DN]

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Vegetation – Historic: Man has heavily influenced the vegetation of the Yucatán Peninsula for centuries. **It has been hypothesized that Mayan civilization (700 B.C. – 1500 A.D.) had a profound influence on the forests of the Yucatán,** clearing areas for agriculture and cultivating or protecting useful trees, such as *Manilkara zapota* with its highly prized fruits. The ruins at Tulum, Quintana Roo, Mexico, bear witness to the Mayan legacy in the region. [GD]

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Forest disruption – Economic plants: Scars on chicle trees, *Manilkara zapota* (Sapotaceae), above, bear evidence of recent human influence on vegetation in intact forests. Chicle trees are the source of natural chewing gum, now largely replaced by synthetic products. Earlier this century, a booming industry non-destructively tapped trees for their latex, a practice so widespread that it is now almost impossible to find unscarred trees. [GD]

◀ **Exploration – New species: *Flora Mesoamericana* and other MBG projects have encouraged field work in previously little-explored areas, leading to discoveries of dozens of new species each year.** Major discoveries include *Ticodendron incognitum* (left), first described by Costa Rican botanists in 1989. A large forest tree found in Mexico, Guatemala, Nicaragua, Costa Rica, and Panama, it is the only member of a new plant family, Ticodendraceae. **MBG scientists describe about 200 new plant species every year.** [BEH]

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Economic plants – Agriculture: Poaceae, the grass family, includes the major cereal crops: corn, rice, wheat, as well as sugar cane, *Saccharum officinarum* (left). **Without grasses, human civilization would not have developed.** Above right, cacao pods, *Theobroma cacao* (or "food of the gods" after Aztec folklore), are the source of valuable cocoa exports used to manufacture **chocolate, just one of the multitude of food plants found only in the tropics.** Foresters at Los Mangos Forestry Station in Honduras, right, experiment with **intercropping,** or mixing species in a plot. Such systems **enable farmers to keep land productive for many years,** lessening the need for clearing virgin forests. **Constantly expanding agriculture caused by unabated population growth is primarily responsible for the dramatic decline of natural vegetation throughout the world.** Costa Rica, with the highest rate of deforestation in Mesoamerica, has created **the largest system of protected land in the world,** covering 28% of the country. [GD],[GD],[GD]

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Exploration – Living fossils: *Nyssa talamancana* (above), a large forest tree from Panama and Costa Rica, is a **relict: a survivor of an ancient, formerly widespread genus** of the Northern Hemisphere. **Its closest relative is an extinct species known only from fossils,** rather than the six other living species still found in the U.S. and Southeast Asia. *N. talamancana* was described by Barry Hammel of MBG and Nelson Zamora of INBio, Costa Rica, in 1990. [BEH]

◀ **Families – Orchidaceae: More than 2,000 species of orchids are known from Mesoamerica, where it is by far the largest family,** followed by Asteraceae, Fabaceae, Rubiaceae, and Poaceae. Orchidaceae is the largest plant family worldwide, with over 20,000 species in 700 genera. **About 95% of all orchids occur in the tropics.** Like many Mesoamerican orchid species, *Sobralia luteola,* left, is **endemic, occurring only in a small area of Nicaragua and Costa Rica.** MBG is collaborating on a *Flora de Nicaragua*. [OM]

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Floristics – Bryology: MBG botanist Bruce Allen is producing a *Moss Flora of Central America* to describe all known mosses of the region. **Bryology is the study of mosses, liverworts, and hornworts,** green plants that produce their own food but, because they are disseminated by spores rather than seeds, are thought to be more primitive than flowering plants. There are about 10,000 species of mosses distributed worldwide. **MBG has one of the world's richest collections of bryophyte specimens.**

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Pollination – Flies: *Aristolochia grandiflora* (Aristolochiaceae), below right, a vine found from Mexico to Panama and in the West Indies, has **among the largest flowers in the world and the largest of any Mesoamerican plant.** As with many fly-pollinated species, the flowers are purple in color and produce an odor resembling that of rotten meat. Because of its spectacularly large and oddly shaped flowers, this species is often cultivated as a curiosity. [MC], [PT]

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Plant/Animal Interactions: *Clidemia globulifera* from Costa Rica, above, **has colored berries attractive to fruit-eating birds that distribute the seeds.** It belongs to Melastomataceae, with approximately 475 species, one of the largest families in Mesoamerica. *Passiflora macdougaliana*, left, from Panama, was newly described by *Flora Mesoamericana* coeditor Sandra Knapp. *Passiflora* are a food source of heliconiine butterfly larvae. **Relationships are so precise that new species have been discovered by following butterflies to the host plant** where they deposit their eggs. **Fabaceae, the legume family, is the third largest in the world. Legumes are important sources of foods, timber, forage, resins, and chemicals.** They are extremely diverse in Mesoamerica, ranging from herbs to lianas and dominant forest trees. **Insect pollination predominates in legumes, but birds, especially hummingbirds, are attracted** to long, tubular, red flowers with abundant nectar as found in *Erythrina gibbosa*, right. [WB],[SK],[WB]

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Pteridophytes – Ferns: The second volume of *Flora Mesoamericana* (Vol. 1) will treat 1,382 species of ferns and related groups including quillworts (Isoetaceae), club mosses (Lycopodiaceae), spike mosses (Selaginellaceae), and horsetails (Equisetaceae). It **will be the largest pteridophyte flora ever published** and will include 138 newly discovered species that have been scientifically named and described within the last ten years. [SK]

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Plant/Animal Interactions – Symbiosis: *Acacia mayana*, a legume from Mexico and Guatemala, left, **lives symbiotically with aggressive, biting and stinging *Pseudomyrmex* ants that protect them from herbivorous insects and competing plants.** The ants nest in the large hollow thorns. Ant larvae feed on special food-bodies produced at the tips of the leaves, and large leaf nectaries provide adult ants with food and moisture. [PT]

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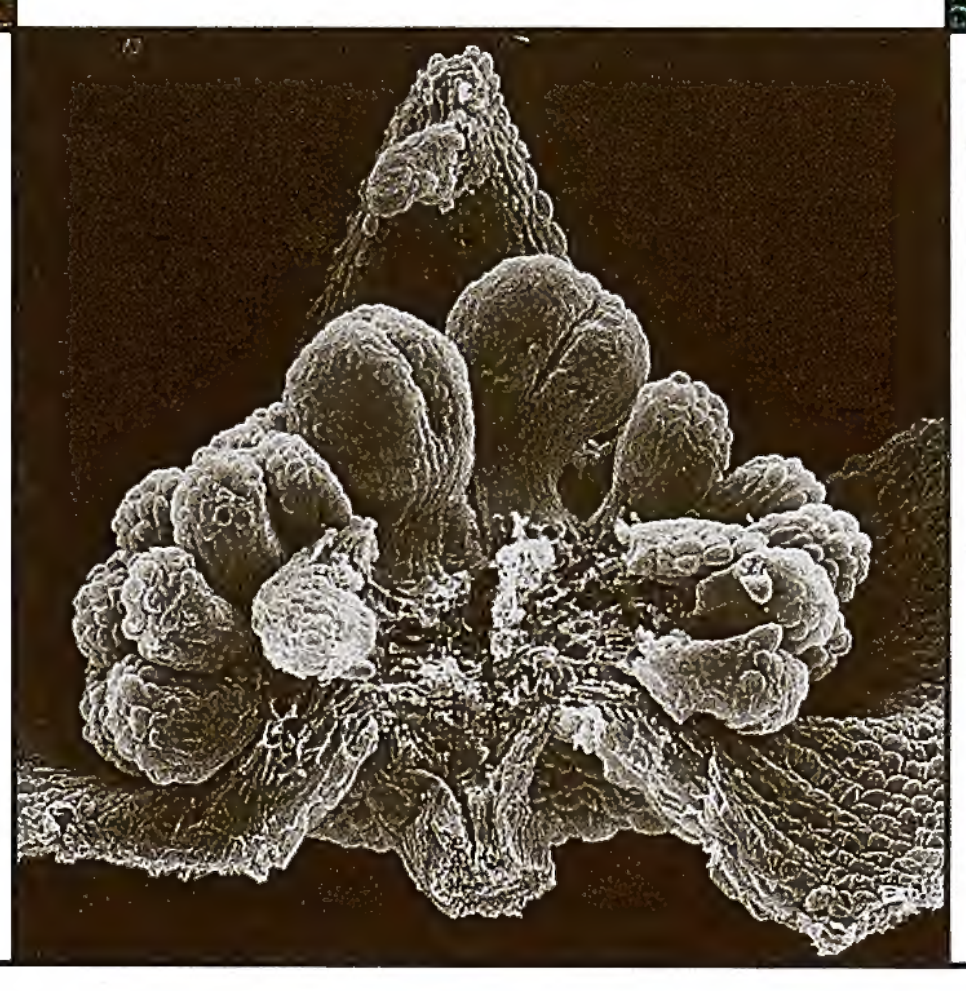
Pollination – Mimicry: The flowers of *Chiranthodendron pentadactylon,* a tree of the Sterculiaceae from Mexico and Guatemala, left, produce abundant nectar and have **extremely large anthers. They are pollinated by perching birds and bats.** Some scientists speculate that the resemblance of the anthers to a hawk's talon leads birds to approach from the lower side, the only position from which the flowers can be pollinated efficiently. [PT]



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Extraordinary Discovery: An electron micrograph of the 4 mm-wide flower of *Lacandonia schismatica*, left, a tiny thread-like plant from southern Mexico, shows its reversed sex organs in longitudinal section: the stamen arises within several rings of pistils. **This arrangement is unique among all quarter million flowering plants known to science.** Discovered during research for *Flora Mesoamericana* by Mexican botanists, the plant has been classified in its own family, Lacandoniaceae. [MV]

This poster is dedicated to the people of Mesoamerica and to the botanists who provide the basic information about its plants. MBG research projects include:

- *Flora Mesoamericana:* Directed by Gerrit Davidse, MBG; Mario Sousa S., UNAM; and Sandra Knapp, BM.
- *Manual de las Plantas de Costa Rica*: National Museum of Costa Rica; the National Institute of Biodiversity (INBio); Barry E. Hammel and Michael H. Grayum, MBG, and Nelson Zamora, INBio.
- *Moss Flora of Central America*: Bruce Allen, MBG.
- *Flora de Nicaragua*: Directed by Kay Tomlinson, MBG, in collaboration with Nicaraguan investigators.

Research at the Missouri Botanical Garden

Fifty-four Ph.D.-level scientists, ten of whom live abroad, technical staff, and graduate students devote their work to collecting and studying plants and to exploration of selected regions. These efforts are concentrated in Mesoamerica, South America, subsaharan Africa, Madagascar, China, and North America. MBG also serves as headquarters for the Center for Plant Conservation and for the major collaborative projects *Flora of China* and *Flora of North America*. Individual MBG scientists are specialists in the plants of particular regions or in the classification of certain plant families, such as the economically important grass, legume, and nightshade families. MBG collaborates with local institutions in each country where it conducts research, providing technical assistance, helping to find funding, establishing relationships with the worldwide scientific community, training botanists in the field and at MBG, and helping to build infrastructure. Botanical research helps to provide the basic scientific knowledge for conservation policies to preserve global biodiversity.

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MBG = Missouri Botanical Garden
[AB] Alan Brant, MBG
[BEH] Barry E. Hammel, MBG
[CW] Cliff Willis, MBG
[DN] David A. Neill, MBG
[GD] Gerrit Davidse, MBG
[MC] Marshall R. Crosby, MBG
[MV] Mike Veith, Washington University
[OM] Olga Martha Montiel, MBG
[PT] Pedro Tenorio, Instituto de Biología, UNAM
[SK] Sandra Knapp, The Natural History Museum, London
[WB] William Burger, Field Museum of Natural History
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